

10/28/99

JC598 U.S. PTO

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PATENT APPLICATION  
TRANSMITTAL**

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. P3091

First Inventor or Application Identifier Orlowski, David C.

Title Improved Bearing Isolator

Express Mail Label No. EL307224329US

**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ \* Fee Transmittal Form (e.g., PTO/SB/17)  
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 7]  
(preferred arrangement set forth below)
- Descriptive title of the Invention
  - Cross References to Related Applications
  - Statement Regarding Fed sponsored R & D
  - Reference to Microfiche Appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 3]
4. Oath or Declaration [Total Pages 1]
- a. ☒ Newly executed (original or copy)
  - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))  
(for continuation/divisional with Box 16 completed)
  - i. ☐ **DELETION OF INVENTOR(S)**  
Signed statement attached deleting  
inventor(s) named in the prior application,  
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

\* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY  
FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT  
IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

ADDRESS TO: Assistant Commissioner for Patents  
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Washington, DC 20231

5. ☐ Microfiche Computer Program (Appendix)
6. ☐ Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
  - b. ☐ Paper Copy (identical to computer copy)
  - c. ☐ Statement verifying identity of above copies

**ACCOMPANYING APPLICATION PARTS**

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney  
(when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO-1449 [Copies of IDS Citations]
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)
13. ☒ \* Small Entity Statement(s) filed in prior application,  
(PTO/SB/09-12) Status still proper and desired
14. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)
15. ☐ Other: \_\_\_\_\_

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment.

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: \_\_\_\_\_

Prior application information: Examiner \_\_\_\_\_ Group / Art Unit \_\_\_\_\_

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

**17. CORRESPONDENCE ADDRESS**☐ Customer Number or Bar Code Label

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Name (Print/Type)	Harsha, H. Vincent	Registration No. (Attorney/Agent)	18,045
Signature	<i>Harsha</i>	Date	10-28-99

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JC503 U.S. PTO  
09/428982  
10/28/99

Applicant or Patentee: David C. Orlowski and Thomas D. Coe Atty Docket No. P3091  
Serial or Patent No.: Not Yet Assigned  
Filed or Issued: Herewith  
For: Improved Bearing Isolator

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS**  
(37 C.F.R. 1.9(f) AND 1.27(c) - SMALL BUSINESS CONCERN)

I hereby declare that I am

- ☒ the owner of the small business concern identified below:  
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: Isotech of Illinois, Inc.  
ADDRESS OF CONCERN: 3407 78<sup>th</sup> Avenue West, Rock Island, Illinois 61201 USA

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 C.F.R. 121.12, and reproduced in 37 C.F.R. 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled: Improved Bearing Isolator  
by inventor(s): David C. Orlowski and Thomas D. Coe described in:

- ☒ the specification filed herewith.  
☐ Application Serial No. \_\_\_\_\_, filed \_\_\_\_\_.  
☐ Patent No. \_\_\_\_\_, issued \_\_\_\_\_.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or by any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e). \*NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities. (37 C.F.R. 1.27)

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

NAME \_\_\_\_\_  
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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: David C. Orlowski  
TITLE OF PERSON OTHER THAN OWNER: President  
ADDRESS OF PERSON SIGNING: 2901 106<sup>th</sup> Avenue West, Milan, Illinois 61264 USA

SIGNATURE: [Signature] DATE: 10/27/99

## IMPROVED BEARING ISOLATOR

### BACKGROUND OF THE INVENTION

This invention relates generally to shaft sealing devices and more particularly to seals which will effectively seal lubricant in a housing, not only during normal operating conditions, but also under the unusual conditions of high oil levels or turbulence of the oil.

Currently, with usually high oil or lubricant levels i.e., levels approaching the outer diametric surface of the shaft, the effectiveness of the drain, which was located near the shaft and an inclined diminished trough. Under normal or ideal conditions lubricant was stripped from the shaft, collected in the labyrinth collection grooves of the seal and drained back to the oil sump by gravity. Under high lubricant levels the drain often became non-functional.

In the case of a high level of lubricant, lubricant stripped from the shaft was then transferred outward along the shaft to the rotor/stator interface with the result being a leaking seal i.e., leaking fluids to the outer side of the seal.

Another condition, which caused leaking seals, was high lubricant turbulence. This turbulence was caused by meshing gears or cylindrical roller bearings agitating the oil and the oil would then impinge on the exit drain trough and inhibit downward or inward flow of the lubricant down the trough's slope and transfer along the shaft with a leaking seal being the result.

The location of the drain or trough close to the shaft also caused leakage in the cases where pressure lubricated sleeve bearings for being utilized. The pressurized lubricants at the shaft to bearing interface tended to travel parallel to and along the shaft and impinge on the slope of the drain and climb the slope thereby leaking out of the seal.

### SUMMARY OF THE INVENTION

The present invention is a improvement over the prior art in that the leakage of lubricant is eliminated during high oil levels or high levels of turbulence or axial impingement as well as during normal operation.

The invention has incorporated a large collection groove or grooves in the stator with a improved location of the drain. This collection groove should be as deep and wide as possible to maximize the collection of lubricant. The lubricant in the collection groove is drained to the sump with an orifice located at the lowest point of the seal and is also as far away from the shaft as possible.

Present drain holes are located close to the shaft and the inner diameter of the stator as contrasted to their location this invention wherein the drains are close to the outer diameter of the stator.

If no external contaminants are present or need to be rejected, the seal may comprise only the stator with its collection groove or grooves and a drain hole & trough at the outer extremity of the stator.

The stator presents a blank wall to impinging lubricant. The sides of groove are located radially close to the shaft which also acts to restrict the flow of lubricant along the shaft. More lubricant may be collected in a larger collection groove to aid the sealing action.

### DESCRIPTION OF THE DRAWINGS

Figure 1 – shows a cross-sectional view of the seal with rotor in a housing on a shaft.

Figure 2 – is a view of the wall of the collecting groove with drain ports.

Figure 3 – is a cross-sectional view of the stator seal without the rotor present.

Figure 4 – is a cross-sectional view of the seal with a rotor in a housing on a shaft without an ejection port.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Fig.1 which shows the seal 11 including rotor 12 and stator 13 in housing 14. Shaft 15 has a bearing 16 mounted on shaft 15. Rotor 12 is rotated with shaft 15 by o-ring 17. Stator 13 is affixed to the housing 16 by seal 18. Stator 13 also has a groove 19 formed by sidewalls 19a and 19b. This groove 19 should be as deep and wide as possible depending upon the radial cross-section and the material characteristics of the stator 11.

There may be more than one groove 19, however all material limitations must be observed with a plurality of grooves i.e., the radial cross section and material characteristics must still be limiting factors as to the depth and width of the groove.

There is an axial slot 20 incorporated to the stator 13 at the outer radial limits of groove 19. This slot 20 or hole includes a sloping surface or trough 20a to carry lubricant to the sump 30. The slot may be circular or elongated around the periphery of the stator wall 19a. Slot 20 may be a plurality of circumferential slots as shown in fig 2. Slot 20 intersects and penetrates

into groove 19 at an angle to the shaft 15 and intersects the diameter of groove 19 at the outer diameter, approximately one-half of the diameter of the hole or orifice.

Slot 20 is as far away from shaft 15 and the stator 11 interface as possible. The inner radial surfaces of stator groove walls 19a and 19b should be as close to shaft 15 as possible. The radial dimension between shaft 15 and the seal faces 19c should be in the range of 0.005 inches per inch of shaft diameter. As shown in fig. 2 the stator may be rotated while always providing a fixed downward position of at least one drain hole for the draining of the lubricants back to the sump 30.

The contaminant expulsion is not assured when rotation of this seal occurs. However this invention provides that in one configuration, the rotor 12, that the diameter at interference of rotor 12 with stator 13 is greater than the diameter of stator 13. This differential creates a pumping action of contaminants outwardly at the rotor/stator interface because of ever increasing diameter in the direction of the intended path of contaminants expulsion and exclusion.

As shown if fig. 3, the stator 13 can operate alone where no external contaminants are to be encountered. The seal consisting only of stator 13 can be simplified in this case as no interplay or labyrinth required between the rotor and stator parts. This can greatly reduce costs of oil retention, if retention is the only requirement.

Having described the preferred embodiment, other features of the present invention will undoubtedly occur to those versed in the art, as will numerous modifications and alterations in the embodiments of the invention illustrated, all of which may be achieved without departing from the spirit and scope of the invention as defined in the appended claims.

## CLAIMS

What is claimed is:

1. An isolator mechanism for use with a housing having a bearing with lubricant in the housing and a shaft protruding through the housing, the isolator comprising:
  - a) a stator affixed to the housing and surrounding the shaft;
  - b) said stator having a radial groove formed therein with the walls of said groove extending between said housing and said shaft;
  - c) the exterior surface of a first wall of said groove facing the interior of the housing;
  - d) an axial hole in said first wall at the lower extremity of said first wall from said shaft connecting said groove to said housing.
2. An isolator accordance with Claim 1, wherein said radial groove is more than one-half the radially dimension of said stator.
3. An isolator accordance with Claim 1, wherein said hole in said first wall of stator includes an axially sloping surface connecting said radial groove to said housing.
4. An isolator accordance with Claim 3, wherein said hole and said sloping surface are elongated.
5. An isolator accordance with Claim 3, wherein said hole and said sloping surface are milled in said first wall.
6. An isolator accordance with Claim 1, wherein the inside diameter of said stator is proportional to the diameter of said shaft.
7. An isolator accordance with Claim 6, wherein the proportion of said stator to said shaft is 0.005 inches per inch of shaft diameter.
8. An isolator accordance with Claim 4, wherein said hole and said sloping surface are elongated circumferentially.
9. An isolator mechanism for use with a housing having a bearing with lubricant in a housing and a shaft protruding through the housing, the isolator comprising:
  - a) a stator affixed to the housing and surrounding the shaft;
  - b) said stator having a plurality of radial grooves formed therein with the walls of said grooves extending between said housing and said shaft;

c) the exterior surface of a first wall of said grooves facing the interior of the housing;

d) an axial hole in said walls at the extremity of said walls from said shaft connecting said grooves to said cavity.

10. An isolator accordance with Claim 9, wherein said radial grooves are more than one-half the radial dimension of said stator.

11. An isolator accordance with Claim 10, wherein said hole in said walls of said stator include a sloping surface connecting said radial grooves to said housing.

12. An isolator accordance with Claim 11, wherein said hole and said sloping surface are elongated.

13. An isolator accordance with Claim 12, wherein said hole and said sloping surface are milled in said walls of said stator.

14. An isolator accordance with Claim 9, wherein the inside diameter of said stator is proportional to the shaft diameter.

15. An isolator accordance with Claim 14, wherein the proportion between said stator and said shaft is 0.005 inches per inch of shaft diameter.

16. An isolator accordance with Claim 12, wherein said hole in said stator is elongated circumferentially.

17. An isolator mechanism for use with a housing having a bearing with lubricant in the housing and a shaft protruding through the housing, to isolator comprising:

- a) a stator affixed to the housing and surrounding the shaft;
- b) said stator having a radial groove formed therein with the walls of said groove extending between said housing and said shaft;
- c) the exterior surface of a first wall of said cavity facing the interior of the housing;
- d) a plurality of axial holes in said first wall at the extremity of said first wall from said shaft connecting said groove to said housing.

18. An isolator mechanism for use with the housing having a bearing with lubricant in the housing and a shaft protruding through the housing, the isolator comprising:

- a) a stator affixed to the housing and surrounding the shaft;
- b) said stator having a radial groove formed therein with the walls of said grooves extending between said housing and said shaft;

c) the exterior surface of the first wall of said groove facing the interior of the housing;

d) an axial hole in said first wall at the extremity of said first wall from said shaft connecting said groove to said cavity;

e) a rotor affixed to said shaft and rotating therewith interfacing with said stator.

19. An isolator accordance with Claim 18, wherein said hole in said first wall of said stator includes a sloping surface connecting said radial groove to said housing.

20. An isolator in accordance with Claim 18, wherein said radial groove is more than one-half the radial dimension of said stator.

21. An isolator in accordance with Claim 19, wherein said hole and said sloping surface are elongated.

22. An isolator in accordance with Claim 19, wherein said hole and said sloping surface are milled in said first wall.

23. An isolator in accordance with Claim 18, wherein the inside diameter of said stator is proportional to the shaft diameter.

24. An isolator in accordance with Claim 18, wherein the interface between the rotor and stator includes an ejection port for ejection of contaminants from the exterior without reaching the housing.

25. An isolator in accordance with Claim 24, wherein the contaminants are expelled by the pumping action between the rotor and the stator.

26. An isolator in accordance with Claim 18, wherein said rotor surrounds said stator and prohibits the entry or exit and subsequent contaminants.



## ABSTRACT

A bearing isolator mechanism is adapted to use with a machinery housing having rotatable shaft protruding through the housing. The isolator mechanism comprises a stator surrounding said shaft and being affixed to the housing, the stator having a single groove or multiple deep grooves in the stator extended radially from said shaft. The wall ends of the stator forming the sides of the deep groove are located in as close proximity as mechanically possible to the shaft. The groove is as deep and wide as possible within the mechanical constraints of the stators width and the material. The groove in said stator has a hole or orifice in the stator wall that connects said groove in said housing at the lower extremity of the groove in the stator. The hole or holes should interrupt the grooves outer diameter by one-half the diameter of hole or orifice. The holes if more than one, may be elongated and spaced around the circumference of the stator to permit positioning and rotation of the housing with relationship to the shaft.

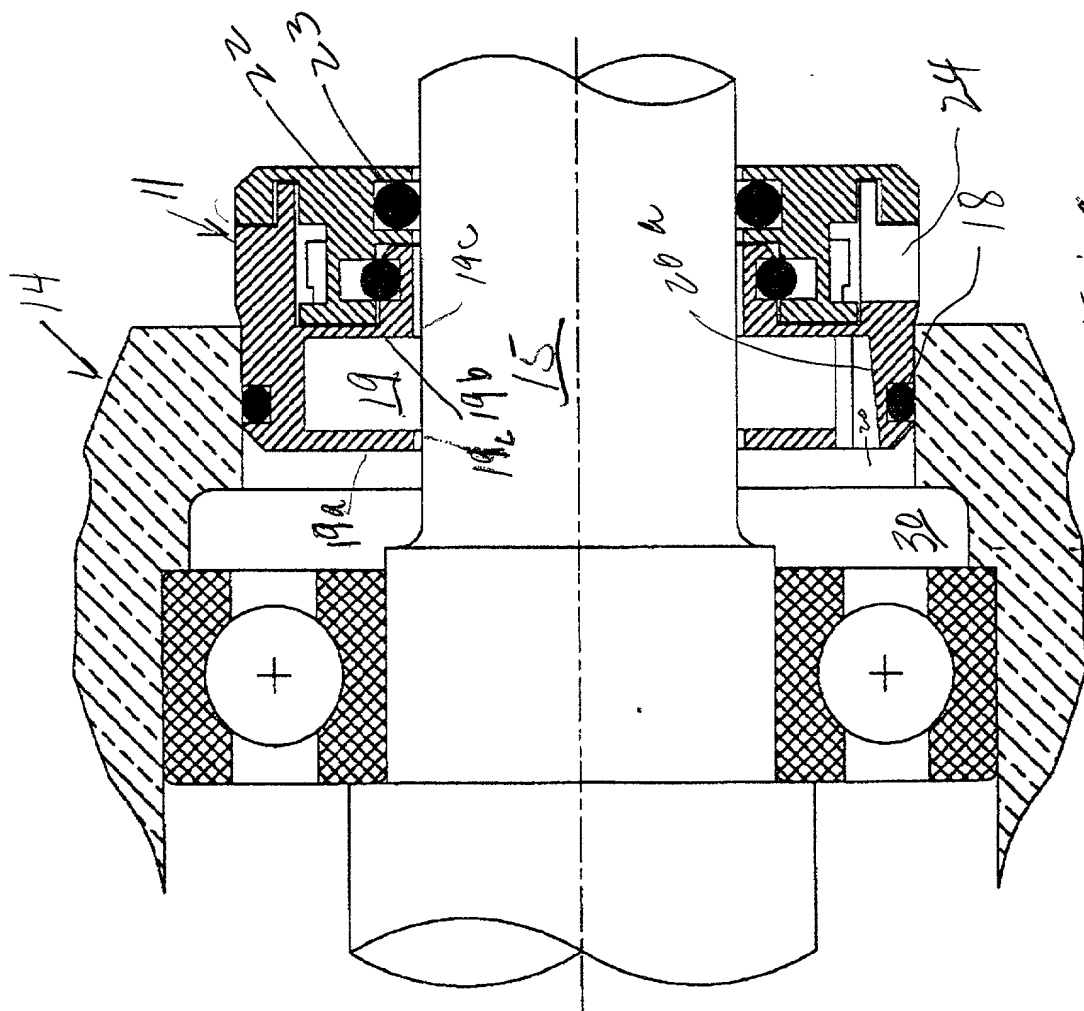


Fig 1

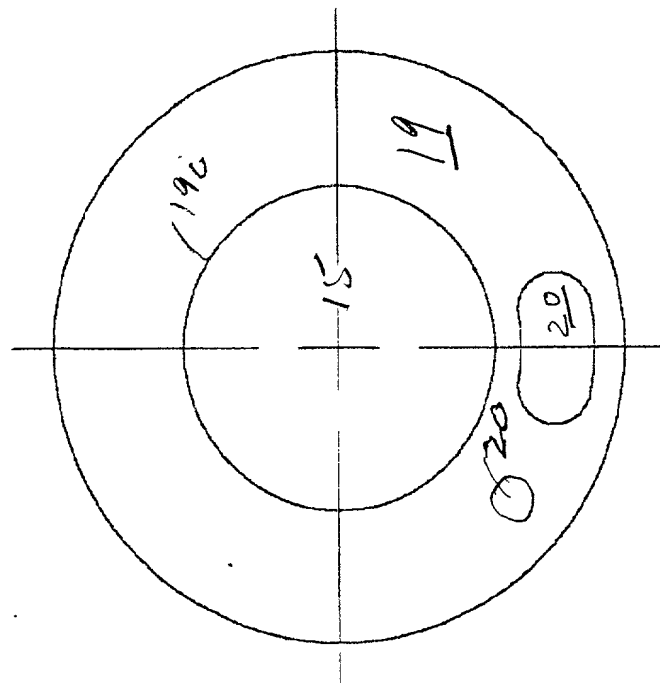


Fig 2

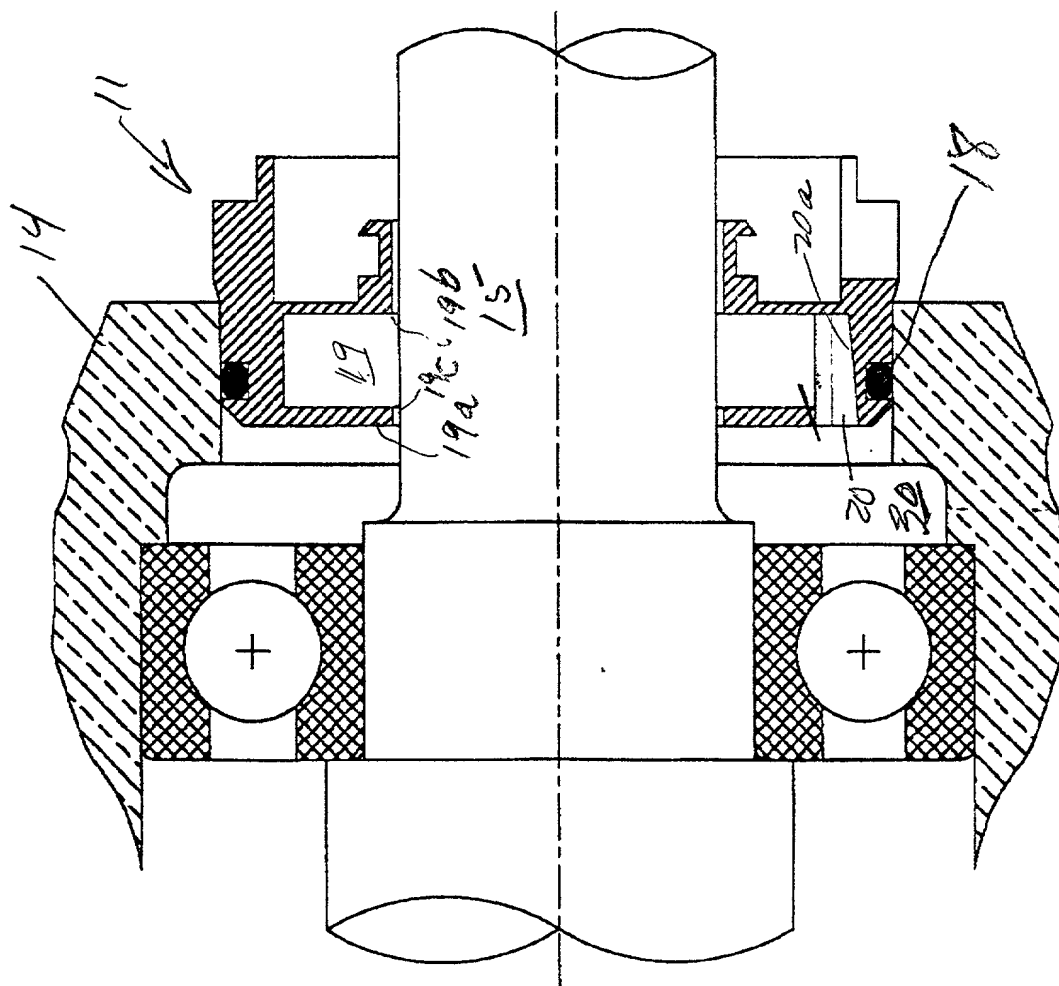


Fig 3

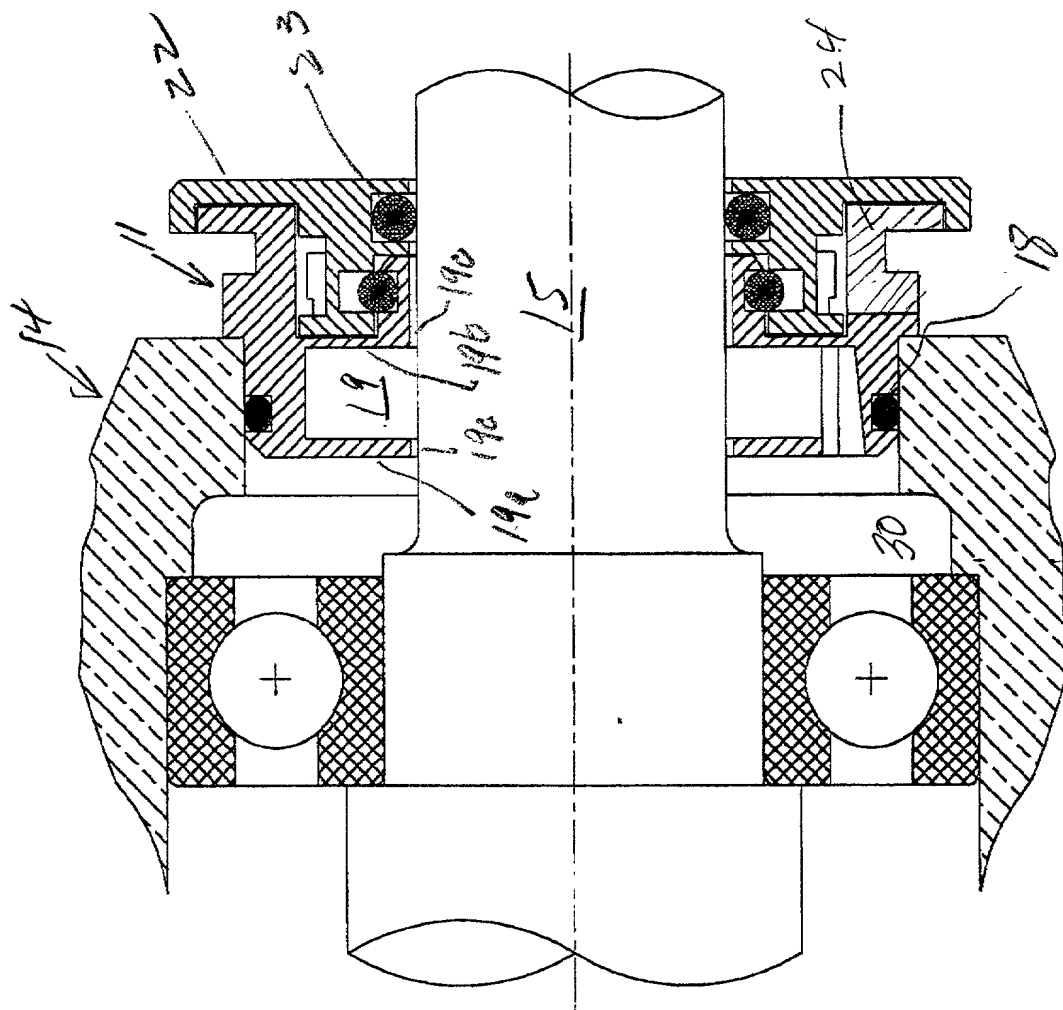


Fig 4

# PATENT APPLICATION DECLARATION AND POWER OF ATTORNEY

## I HEREBY DECLARE THAT:

My residence, post office address, and citizenship are as stated below.

I believe I am the original, first, and sole inventor (if only one name is listed) or an original, first, and joint inventor (if plural names are listed) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **IMPROVED BEARING ISOLATOR**, the specification of which:

☒ is attached hereto;

☐ was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims as amended by any amendment referred to herein.

I acknowledge the duty to disclose all information to the Patent and Trademark Office known to me to be material to patentability of this application, as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

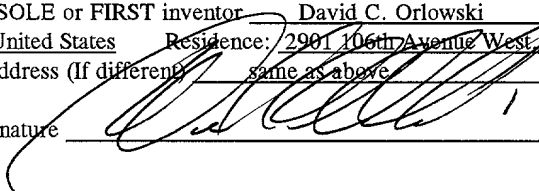
I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

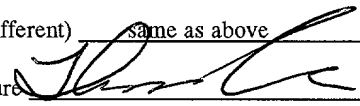
I hereby appoint the following as my attorneys or agents with full power of substitution to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith:

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Third Inventor's signature \_\_\_\_\_ Date: \_\_\_\_\_